

LESSON 3: RIVER FLOWS AND SEDIMENT MOVEMENT

ESSENTIAL QUESTION:

What combination of factors both natural and manmade is necessary for healthy river restoration, and how does this enhance the sustainability of natural and human communities?



GUIDING QUESTION:

Seasonal weather patterns affect the flow patterns of water into the rivers (and watersheds) of western North America. What landform features can form when erosion is caused by fast-moving water from Spring and Fall rains, and snowpack melt off?

OVERVIEW:

The focus of this lesson is to learn about the seasonal flow patterns of rivers in western North America, and the erosional effects of fast-moving water. Rivers in the west tend to experience high flows during the spring rains and snowpack melt off, low flows during the long summer drought, increased flows during the return of the fall rains, and slightly lower flows in winter when much of the precipitation is trapped as snow. However, strong storms can result in sudden spikes of water flows and flash flooding.

Fast-flowing rivers can move large stones and carry a lot of sediment, so they have the ability to pluck stones from the bedrock and can carve deep canyons. Eventually fast-flowing rivers form V-shaped valleys, with terraces/benches forming along former riverbeds. Where flows reach steep gradients, rapids and waterfalls will form. The goal of this lesson is to demonstrate the features that can form in these fast-flowing streams.

TIME:

One class period

MATERIALS:

- **Lesson 3- River Flows and Sediment Movement.pptx**
- **Lesson 3a- River Flows and Sediment Movement.pdf**
- **Lesson 3 Demonstration/Lab Activity Sheet.doc**
- **Waterfalls and Headward Erosion.pptx**
- **Waterfalls and Headward Erosion.pdf**
- Stream Table
- Reflection Journal Pages (printable handout)
- Vocabulary Notes Page (printable handout)

PROCEDURE:

1. Review the Essential Question, introduce the Guiding Question.
2. Students should take a few minutes to respond to the reflection prompts. Discuss their answers and any questions they've generated.
3. Hand out Vocabulary Notes. Review the words. Students can define words as they watch the PowerPoint Lesson.
4. Present the PowerPoint Lesson
5. Run Demonstration on stream table of high gradient V-shaped valleys
6. Run Demonstration on stream table of waterfalls and headward erosion
7. Give students handout on groundwater features and have them identify the different parts
8. Finally, have students respond to the second Reflection Journal page

ASSESSMENTS:

WASHINGTON STATE STANDARDS:

1. **EALR 4: ES2G** Landforms are created by processes that build up structures and processes that break down and carry away material through erosion and weathering.
 - a. Explain how a given landform (e.g., mountain) has been shaped by processes that build up structures (e.g., uplift) and by processes that break down and carry away material (e.g., weathering and erosion).
2. **EALR 4: ES3D** Earth has been shaped by many natural catastrophes, including earthquakes, volcanic eruptions, glaciers, floods, storms, tsunamis, and the impacts of asteroids.
 - a. Interpret current landforms of the Pacific Northwest as evidence of past geologic events
3. **EALR 4: PS1C** Unbalanced forces will cause changes in the speed or direction of an object's motion.
 - a. Determine whether forces on an object are balanced or unbalanced and justify with observational evidence.

READING

1. **EALR 1:** The student understands and uses different skills and strategies to read.
 - a. **Component 1.2** Use vocabulary (word meaning) strategies to comprehend text.

SOCIAL STUDIES

1. **EALR 5:** The student understands and applies reasoning skills to conduct research, deliberate, form, and evaluate positions through the processes of reading, writing, and communicating.
 1. **Component 5.2:** Uses inquiry-based research.

WRITING

1. **EALR 2:** The student writes in a variety of forms for different audiences and purposes.
 - a. **Component 2.1:** Adapts writing for a variety of audiences.

ADDITIONAL RESOURCES AND ENRICHMENT:

<http://geography.howstuffworks.com/terms-and-associations/river.htm>

<http://geography.howstuffworks.com/search.php?terms=river+flow+erosion&gallery=1&media=video>

<http://geography.howstuffworks.com/terms-and-associations/waterfall.htm>

VOCABULARY TERMS:

- **V-shaped valley:** A steep valley carved by a fast-flowing river that takes on a shape that resembles a V.
- **Terrace/bench:** A generally flat area elevated above a river, which at one time was the former riverbed, before the river eroded deeper into the basin.
- **Rapids:** A sudden change in gradient, particularly over erosion-resistant materials, will cause the river to become turbulent and the velocity increases.
- **Waterfall:** A cascade of falling water where there is a vertical or almost vertical step in a river.
- **Kolk:** A vortex in a fast-flowing river, which plucks river bed material, forming a depression in the rock and often a pool or pond.
- **Plucking:** The removal of stones from a riverbed or bedrock by the erosional force of moving water.
- **Gorge:** A deep, narrow section of a river caused by erosion into the bedrock.



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River Flows and Sediment Movement
Vocabulary Notes

V-shaped valley:

Terrace/bench:

Rapids:

Waterfall:

Kolk:

Plucking:

Gorge:



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Reflection Journal 1

Try to remember what you've learned about erosion in other science classes then write down what you know already know about erosion.

What questions do you have about erosion?



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Reflection Journal 2

Where have you seen V-shaped valleys? What other landforms have you seen that might have been formed by the erosional force of fast-moving water?

What new questions do you have about river flows and sediment movement?